University of Macau
Department of Electromechanical Engineering
DRWG120 - Mechanical Drawing
Syllabus
2nd Semester 2010/2011
Part A – Course Outline

Compulsory course in Electromechanical Engineering

Course description:
Auxiliary Views. Blocks. Mechanical Fasteners. Gears and Cams. Surface Development. Working Drawings. 3D AutoCAD operations.

Prerequisite:
DRWG101 - Technical Drawing

Textbook:
- Douglas Smith, Antonio Ramirez, ***Technical Drawing 101 with AutoCAD***, Prentice Hall, 2009. ISBN: 0131751220

Reference:
- Cecil Jensen, Engineering drawing & design, McGraw-Hill, 2008.

Course objectives:
1. Learn graphical communication language that engineers practice. [g]
2. Recognize the need for life long learning by encouraging students to learn many aspects of CAD software and its user interface on their own since such engineering tools keep evolving. [i]
3. Learn graphical techniques as well as use of modern CAD software. [l]
4. Develop the skills in CAD operations to visualize, create, and modify 3D solid models. [l]

Topics covered:
1. **Auxiliary Views** – Primary Auxiliary Views; Multi-Auxiliary-View Drawings; Secondary Auxiliary Views; Revolution; True Length of a Line; Points, Lines, and Planes in Space; Point on a Line; Visibility of Lines in Space; Distance Between Lines and Points; Edge and True View of Planes; Angles Between Lines and Planes.
2. **Blocks** – Creating Blocks; Inserting Blocks into a Drawing; Editing Blocks.
3. **Threaded Fasteners** – Thread Terminology; Thread Forms; Thread Drawings: Detailed, Schematic, and Simplified Representations.
4. **Gears** – Types of Gears; Terminology; Formulae; Drawing of Involute; Simplified Drawings of Gears.
5. **Miscellaneous Types of Fasteners** – Keys; Splines; Pin Fasteners; Retaining Rings; Springs; Rivets.
6. **Cams and Cam Followers** – Types of Cams; Types of Cam Followers; Cam Nomenclature; Cam Motions; Cam Displacement Diagrams; Eccentric Plate Cam; Conjugate Cam; Face Cam; Drum Cam Drawing; Indexing Drives; Cam Applications.
7. **Surface Development** – Surface Development Drawings; Joints, Seams, and Edges; Parallel Line Development; Radial Line Development; Transition Pieces; Parallel Joint; Oblique Joint; Development of a Sphere: Gore Method and Zone Method.
8. **Intersection** – Intersecting Prisms. Intersecting Cylinders. Intersection of Cylinders and Prism. Intersection of Cylinder and Cone. Intersection of Plane and Curved Surface.
9. **Mechanical Working Drawings** – Assembly Drawings; Exploded Assembly Drawings; Detail Drawings.
10. **Architectural Working Drawings** – Floor Plans; Electrical Plans; Elevations; Building Services Drawings.
11. **3D Modeling Basics** – Setting the 3D Modeling Environment; Extruding 2D Entities to Create 3D Objects; Editing 3D Solid Models; Viewing 3D Objects; Wireframe Models; Shaded Models; Rendering.

Class schedule and credits:

Timetabled work in hours per week			No of teaching weeks	Total hours	Total credits	No / Duration of exam papers
Lecture	Tutorial	Practice				
2	0	4	14	84	3	1 / 3 hours

Topic Outline:

Week No.	No. of hours	Topics
1, 2, 3	18	**Auxiliary Views** Primary Auxiliary Views; Multi-Auxiliary-View Drawings; Secondary Auxiliary Views; Revolution; True Length of a Line; Points, Lines, and Planes in Space; Point on a Line; Visibility of Lines in Space; Distance Between Lines and Points; Edge and True View of Planes; Angles Between Lines and Planes. **Blocks** Creating Blocks; Inserting Blocks into a Drawing; Editing Blocks.
4	6	**Threaded Fasteners** Thread Terminology; Thread Forms; Thread Drawings: Detailed, Schematic, and Simplified Representations.
5	6	**Gears** Types of Gears; Terminology; Formulae; Drawing of Involute; Simplified Drawings of Gears.
6	6	**Miscellaneous Types of Fasteners** Keys; Splines; Pin Fasteners; Retaining Rings; Springs; Rivets.
7	6	**Cams and Cam Followers** Types of Cams; Types of Cam Followers; Cam Nomenclature; Cam Motions; Cam Displacement Diagrams; Eccentric Plate Cam; Conjugate Cam; Face Cam; Drum Cam Drawing; Indexing Drives; Cam Applications.
8	6	**Surface Development** Surface Development Drawings; Joints, Seams, and Edges; Parallel Line Development; Radial Line Development; Transition Pieces; Parallel Joint; Oblique Joint; Development of a Sphere: Gore Method and Zone Method.
9	6	**Intersection** – Intersecting Prisms. Intersecting Cylinders. Intersection of Cylinders and Prism. Intersection of Cylinder and Cone. Intersection of Plane and Curved Surface.
10, 11	12	**Mechanical Working Drawings** Assembly Drawings; Exploded Assembly Drawings; Detail Drawings.
12	6	**Architectural Working Drawings** Floor Plans; Electrical Plans; Elevations; Building Services Drawings.
13, 14	12	**3D Modeling Basics** Setting the 3D Modeling Environment; Extruding 2D Entities to Create 3D Objects; Editing 3D Solid Models; Viewing 3D Objects; Wireframe Models; Shaded Models; Basics of Rendering.

Contribution of course to meet the professional component:

This course prepares students to work professionally in the area of **engineering graphics**.

Relationship to EME program objectives and outcomes:

This course primarily contributes to Electromechanical Engineering Program outcomes that develop student abilities to:

(g) an ability to communicate effectively.

(l) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

The course secondarily contributes to Electromechanical Engineering program outcomes that develop student abilities to:

(i) an ability to recognize the need for, and to engage in life-long learning.

Course content:

Maths	Engineering Science	Engineering Design and Synthesis	Complementary Studies	Computer Studies	Total 100%
10	20	40	0	30	100

Course modulator:

Dr. Zhixin Yang

Persons who prepared this description:

Mr. Seng Kin Lao, Dr. Zhixin Yang, Prof. Vai Kuong Sin

Part B – General Course Information and Policies

2nd Semester 2010/2011

Instructor: Mr. Seng Kin Lao
Office Hour: By appointment
Email: skeltonl@umac.mo
Office: N327C/NLG104
Phone: (853) 8397-4379, 4289

Time/Venue:

Every Monday, 8:30 a.m. - 10:30 a.m., Room T103
Every Friday, 1:30 p.m. - 5:30 p.m., Room T103

Assessment:

Final assessment will be determined on the basis of:
Homework: 70%
Final Exam: 30%

Grading System:

The credit is earned by the achievement of a grade from 'A' to 'D'; 'F' carries zero credit.

Grades are awarded according to the following system:

Letter Grades	Grade Points	Percentage
A	4.0 (Excellent)	93-100
A-	3.7 (Very good)	88-92
B+	3.3	83-87
B	3.0 (Good)	78-82
B-	2.7	73-77
C+	2.3	68-72
C	2.0 (Average)	63-67
C-	1.7	58-62
D+	1.3	53-57
D	1.0 (Pass)	50-52
F	0 (Fail)	Below 50

Comment:

The objectives of the lectures are to explain and to supplement the text material. Students are responsible for the assigned material whether or not it is covered in the lecture. Students who wish to succeed in this course should read the assignments prior to the lecture and should work all homework and lab assignments. You are encouraged to look at other sources (other texts, etc.) to complement the lectures and text.

Homework Policy:

The completion and correction of homework is a powerful learning experience; therefore:

- Homework is due one week after assignment unless otherwise noted. No late homework is accepted.
- Possible revision of homework grades may be discussed with the grader within one week from the return of the marked homework
- The course grade will be based on the average of the homework grades.

Note:

- Attendance is strongly recommended.
- Check UMMoodle (webcourse.umac.mo) for announcement, homework and lectures. Report any mistake on your grades within one week after posting.
- No make-up exam is give except for CLEAR medical proof.
- No exam is given if you are 30 minutes late in the final exam. Even if you are late in the exam, you must turn in at the due time.

- Cheating is absolutely prohibited by the university.

Appendix - Rubric for Program Outcomes

Rubric for (g)	5 (Excellent)	3 (Average)	1 (Poor)
Professional Impact	Student's/Team's/Group's document(s)/presentation(s) is/are considered to be of professional quality	Student's/Team's/Group's document(s)/presentation(s) is/are considered acceptable for college level work	Student's/Team's/Group's document(s)/presentation(s) is/are considered unacceptable for college level work
Written Component	Document is nearly error free with sophisticated use of vocabulary, formatted properly, with well developed concise sentences and paragraphs	Document contains some errors with a somewhat colloquial vocabulary, minor formatting issues, with some organizational issues that do not interfere with communication	Document contains many errors, very colloquial vocabulary, with severe organizational issues that interfere with communication. Document would be considered unacceptable.
Oral Component	Presentation is consistent, uniform, clear, direct, complete and captivating with very clear fonts and graphics with an excellent layout that clearly presents the technical content	Presentation is somewhat inconsistent between speakers, occasionally difficult to hear, with an acceptable layout containing acceptable fonts and graphics that adequately presents the technical content	Presentation is very inconsistent between speakers, difficult to hear with a poor layout containing illegible fonts and graphics that poorly presents the technical content. Would be considered unacceptable

Rubric for (i)	5 (Excellent)	3 (Average)	1 (Poor)
Research/ Gathering Information	Comprehensive collection of information on a subject, including state-of-the-art and background	Collects adequate information on a subject	Collects minimal information on a subject
Analysis/ Evaluation	Detailed analysis accounting for all the information, conclusions are well supported	Some analysis done but somewhat shallow; some supporting evidence	Analysis simply involves restating gathered information; claims not supported by evidence

Rubric for (l)	5 (Excellent)	3 (Average)	1 (Poor)
Use modern computer and software tools in engineering practice	Student uses the computer and software to correctly analyze engineering problems and/or create engineering designs, and understands the limitations of the software.	Student uses the computer and software to correctly analyze engineering problems and/or create engineering designs.	Student does not use the computer and software to correctly create engineering designs and/or does not correctly interpret the results.